*** Terms used in Conic :**

1. **Axis of Conic :** The line about which given conic is symmetric is called axis of conic.

2. **Vertex of Conic :** The point of intersection of conic and its axis is called vertex of conic.

3. **Focal distance :** The distance of a point on a conic section from its focus is called the focal distance of the point.

4. **Focal chord :** The chord passing through focus of conic is called as focal chord.

5. **Latus Rectum (L.R.) :** The focal chord that is perpendicular to axis of conic is called as 'Latus Rectum' of conic. It is denoted by L.R.

6. **Centre of a Conic :** The point which bisect every chord of the conic passing through it, is called the centre of the conic.

7. **Double ordinate :** A chord passing through any point on the conic and perpendicular to the axis is called double ordinate.

Parabola

The locus of a point whose distance from a fixed point is equal to its distance from a fixed line is called as Parabola.

i.e. SP = PM.

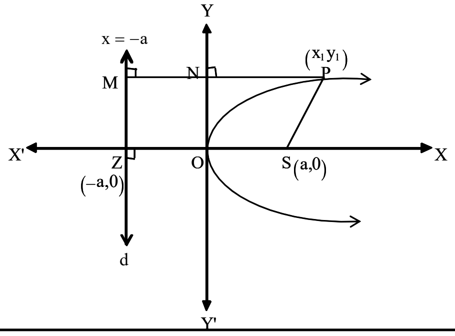
$\therefore$ for parabola, eccentricity e = 1

* **Standard equation of parabola** :

Consider a fixed point S and a fixed line d. S is called focus of parabola and d is called as directrix of parabola.

Draw SZ $\perp$ directrix d. Consider origin O(0,0) is mid point of SZ. Draw X - axis along SZ, accordingly mark, Y-axis.

Let l(SZ) = 2a, $\therefore$ $S \equiv (a,0)$ and $Z \equiv (-a,0)$



Directrix d is parallel to Y-axis and passes through point Z (-a, 0).

$\therefore$ Equation of directrix is x = -a

consider point $P(x_1, y_1)$ is any point on parabola.

Join SP, draw PM $\perp$ directrix.

l(PM) $= l$(PN) + l(MN)

$= x_1 + a$

By focus directrix property for any conic.

$\therefore \dfrac{SP}{PM} = e$

for parabola e = 1

$\therefore \dfrac{SP}{PM} = 1$

$\therefore$ SP = PM .... (i)

By distance formula,

$\sqrt{(x_1 - a)^2 + (y_1 - 0)^2} = x_1 + a$

Squaring on both sides.

$(x_1 - a)^2 + y_1^2 = (x_1 + a)^2$

$\therefore\ x_1^2 - 2x_1a + a^2 + y_1^2 = x_1^2 + 2x_1a + a^2$

$\therefore\ -2x_1a + y_1^2 = 2x_1a$

$\therefore\ y_1^2 = 4ax_1$

$\therefore$ Locus of point P is

$y^2 = 4ax$

is standard equation of parabola having focus as S (a, 0) and equation of directrix as x = -a.

Tracing of parabola : $y^2 = 4ax, a > 0$

1) **Symmetry :** Equation of the parabola can be written as $y = \pm 2\sqrt{ax}$ i.e. for every value of x, there are two values of y which are negatives of each other. Hence, parabola is symmetrical about X-axis.

2) **Region :** For every x < 0, the value of y is imaginary therefore no part of the curve lies to the left of Y-axis.

3) **Origin :** The curve passes through the origin and the tangent at the vertex is Y-axis.

4) **Intersection with the axes :** For x = 0 we have y = 0, therefore the curve meets the co-ordinate axes at the origin O(0, 0).

5) **Extent of parabola :** As $x \to \infty$, $y \to \pm\infty$. Therefore the curve extends to infinity to the right of the Y-axis.

* **Focal Distance of a point :**

Let $P(x_1, y_1)$ be a point on the parabola $y^2 = 4ax$ with focus at S(a, 0) and directrix d